

# Alcatel-Lucent 7450 Ethernet Service Switch

Enabling Profitable  
Carrier Ethernet Services





The Alcatel-Lucent 7450 Ethernet Service Switch (ESS) sets a new market standard for enabling the delivery of profitable Ethernet business services in metro, national and international network environments. It also provides high density service-aware Ethernet aggregation for consumer triple-play services over IP/MPLS-based networks. The Alcatel-Lucent 7450 ESS is purpose-built for the service provider market, with an architecture that supports a wide range of interfaces and offers unmatched density and performance. The 7450 ESS allows service providers to offer new, revenue-generating services for both the consumer and business markets.



# The Changing Service Landscape

## Ethernet Business Services

Enterprise customers are conducting an increasing amount of their business electronically, using information and communications technology (ICT) to drive sales, improve customer relationships, train staff and simplify procurement. This is being done over metro, national and international boundaries. Enterprises want convenience, simplicity and flexible bandwidth across the wide area network, but with the quality of service and control that is critical for business networking applications like video, voice and data. Enterprises are turning to their service providers for help with their communications challenges.

Fortunately, the Alcatel-Lucent solution enables service providers to respond to these needs with Ethernet-based business services, such as virtual private LAN services (VPLS) and virtual leased line (VLL). These services enable enterprise customers to increase business services and reduce costs, thanks to the operational cost benefits of Ethernet and the predictable quality of service (QoS) characteristics of multiprotocol label switching (MPLS).

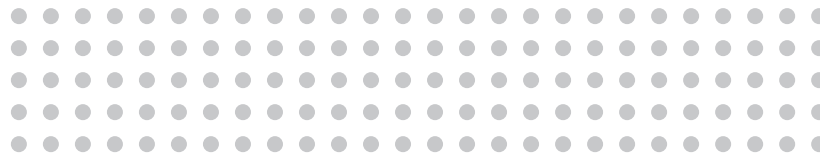
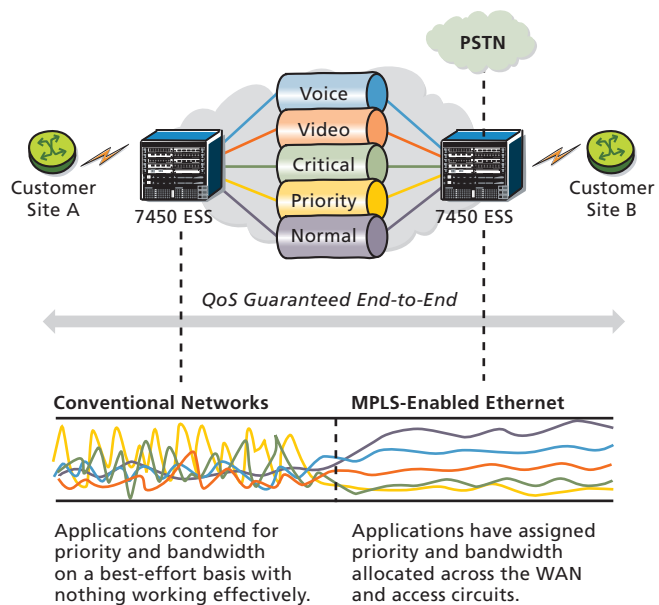


Figure 1. The Value of MPLS-Enabled Ethernet



"There is clear demand from our customers for reliable Ethernet services. The Alcatel VPLS solution will take us from a basic Internet offering to a new level by enabling us to deliver differentiated Ethernet VPN services."

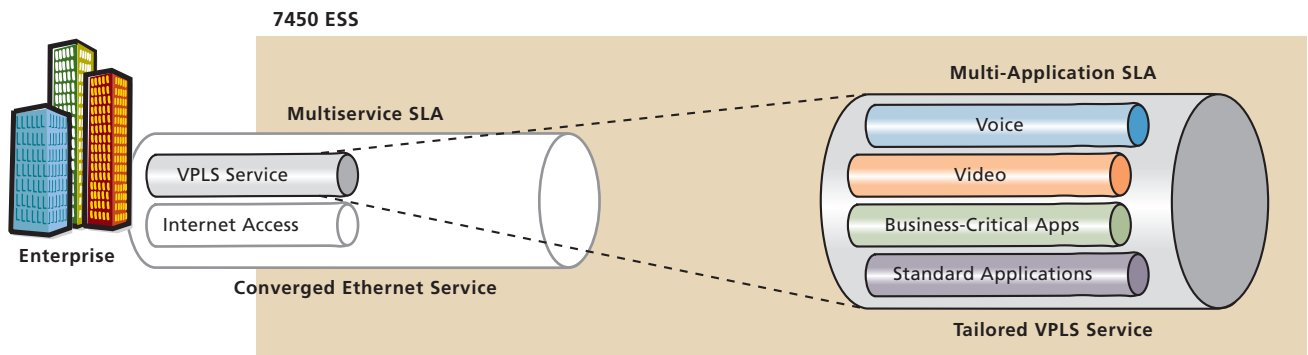
EDGARS RICEVS, PRESIDENT, TELECENTRS

\* This customer reference was provided to Alcatel prior to the merger.

Ethernet virtual private networks (VPNs) complete the service provider service mix — ensuring that they can confidently mix and match Layer 2 and Layer 3 VPN services based on what their customers want. VPLS expands the next-generation VPN service market and enables service providers to offer their customers a Layer 2 multipoint service that provides higher bandwidth than frame relay, with the same QoS as frame relay or ATM. Also, unlike IP-VPNs, which require the enterprise to share routing information, VPLS allows the enterprise to retain routing control and provides the flexibility to support multiple protocols, in addition to IP, that are present in many enterprise networks.

With a next-generation VPLS implementation, service providers can tailor service definitions that directly align with the customers' business objectives and thereby create value. The Alcatel-Lucent 7450 ESS delivers VPLS today with the ability to have different applications run within a single VPLS service with distinct service level agreements (SLAs), as well as an aggregate SLA for each customer. This greater degree of control for service level differentiation is delivered through an extensive QoS implementation, including hierarchical QoS (H-QoS) as illustrated in Figure 2.

Figure 2. Enhanced QoS Options for User-Centric Services



# Triple Play Residential Services

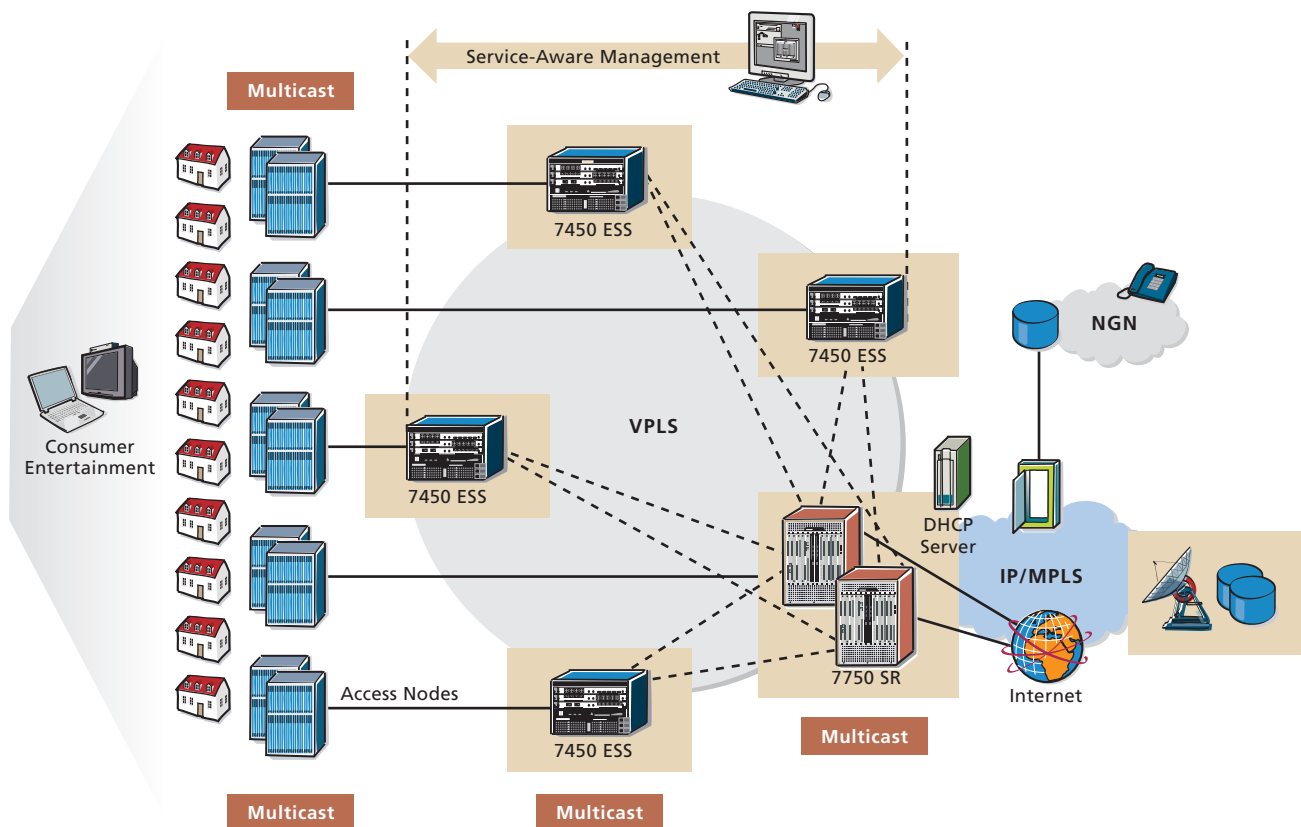
A burgeoning new market exists for Ethernet in the aggregation of consumer triple-play services (see Figure 3). The aggregation network needs to be optimized to meet the demands of voice, video and high-speed Internet services, and above all it must be extremely scalable to support the kinds of subscriber numbers inherent in a consumer-oriented service. For this market, VPLS is used as an enabling underlying technology in the network infrastructure to provide scalability and reliability. Traditional Ethernet would be constrained by the limited number of virtual LANs that can be supported with spanning tree protocol; VPLS overcomes these limitations.

"As a leading provider of 'always-on' services such as triple play for consumers, SBC is expected to deliver the highest levels of reliability and service availability. Alcatel's new features enabling non-stop routing and non-stop services will help SBC to meet the high expectations of our customers."

RALPH BALLART, VICE PRESIDENT, SBC LABS

\* This customer reference was provided to Alcatel prior to the merger.

Figure 3. Alcatel-Lucent 7450 ESS is an Essential Component of a Triple-Play Service Delivery Architecture







# The Service Provider Challenge

These two distinct markets — Ethernet business services and triple play residential services — generate a challenging list of requirements for service providers:

- High **scalability** in terms of number of subscribers and services
- High **reliability** — only carrier-class (99.999 percent) reliability will do
- Support for multiple QoS levels and the ability to monitor per-service **QoS**
- Ability to **guarantee services** on a per-customer, per-service or per-application basis

For service providers to compete effectively, they must be able to:

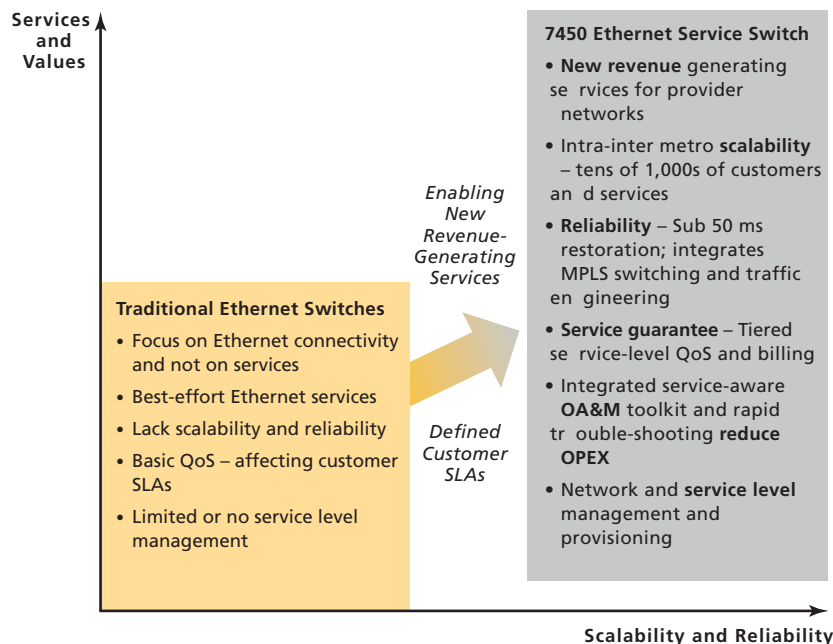
- Match their business service offerings to each enterprise's specific requirements
- Meet the demands of the residential sector with integrated service provisioning and streamlined service, policy and subscriber management
- Turn up new services quickly
- Grow and adapt their service offerings on the fly

To succeed in today's network landscape, service providers need a carrier-class Ethernet service switch. Traditional, enterprise-focused Ethernet switches were developed to provide best-effort connectivity; they simply don't have what it takes to survive — and thrive — in the service provider environment. That's where the Alcatel-Lucent 7450 ESS comes in.

# Addressing Growing Markets with an Ethernet Service Switch

In contrast to traditional Ethernet switches, the Alcatel-Lucent 7450 ESS was specifically designed for the delivery of business and triple-play services, with MPLS as an integral component of its service-oriented architecture. This next-generation design enables service providers to roll out more services, more quickly — services that are backed by carrier-class reliability and scalability (see Figure 4). With the Alcatel-Lucent 7450 ESS, service providers profit from the combined benefits of Ethernet economics and MPLS control.

Figure 4. Moving Up the Value Chain with the 7450 ESS



"The scalability and quality of service inherent in Alcatel's Metro Ethernet solution enable us to provide customers a fully reliable and interactive broadband service. As a result, we can continue to further differentiate ourselves from competitors and grow our business."

OLAV STOKKE, CEO, NEXTGENTEL

\* This customer reference was provided to Alcatel prior to the merger.

## Sized to Suit Any Need

The Alcatel-Lucent 7450 ESS comes in two chassis sizes, the seven-slot ESS-7 and the one-slot ESS-1. The seven-slot chassis of the Alcatel-Lucent 7450 ESS supports one or two switch fabric/ CPU modules (SF/CPM), delivering 100 Gb/s (full duplex, redundant) or 200 Gb/s (full duplex, redundant) fabric/system capacity in eight rack units (one-fifth of a rack). The one-slot shelf provides 20 Gb/s (full duplex) fabric/system capacity in just 1.5 rack units.



Alcatel-Lucent 7450 ESS-7



Alcatel-Lucent 7450 ESS-1

# Highly Reliable Carrier Ethernet Services

The Alcatel-Lucent 7450 ESS is the industry's first Ethernet service switch with carrier high availability. More than ever, high availability is at the forefront of the service provider's criteria for consumer and business Ethernet services. The demand for high availability has been most pronounced at the service provider edge where thousands of connections are hosted and availability options may be limited for WAN Ethernet services and service-aware Ethernet aggregation for consumer triple-play services.

The Alcatel-Lucent 7450 ESS architecture has been developed to meet the stringent requirements for supporting mission-critical applications and services, and a number of high availability features have been designed into the 7450 ESS:

- *Non-Stop Routing* — The Alcatel-Lucent 7450 ESS provides true stateful resiliency of the interior

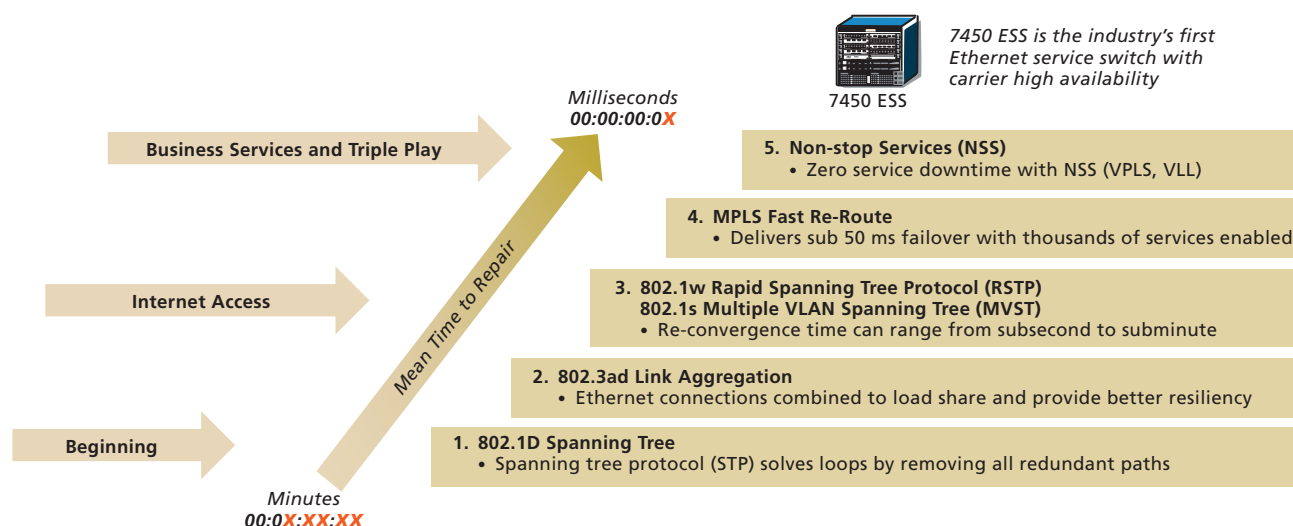
gateway protocol (IGP) routing processes such that all topology information and adjacencies are maintained even in the event of a failure of one SF/CPM. The 7450 ESS supports non-stop routing for open shortest path first (OSPF) and intermediate system-to-intermediate system (IS-IS).

- *Non-Stop Services* — The Alcatel-Lucent 7450 ESS also provides stateful resiliency for protocols that run over the IGP such as MPLS. The 7450 ESS supports non-stop services for VPLS and VLL using tunnels created by label distribution protocol (LDP), targeted LDP, generic routing encapsulation (GRE) and static label switched path (LSP) tunnels.
- *Graceful Restart Helper* — This feature improves availability in cases where the Alcatel-Lucent 7450 ESS is peering with routers not otherwise capable of non-stop routing or services.

"As service convergence over IP networks accelerates, high availability and reliability become important not only for business services, but also for demanding residential applications such as IPTV and online gaming. High availability is moving from being a requirement for business services, to a requirement for all services."

MARK SEERY, RHK.

Figure 5. The Evolution of Ethernet Services to Carrier Reliability





# Carrier-Class Features Provide Carrier-Class Benefits

The 7450 ESS represents a generational leap in carrier high availability enabling service providers to improve their network reliability with non-stop Ethernet services and ensure customer SLAs are preserved (see Figure 5). With its advanced feature set, the Alcatel-Lucent 7450 ESS provides a unique set of benefits for service providers, as described in Table 1.

**Table 1. 7450 ESS Features Address Service Providers' Requirements**

Requirement	Feature	Benefit
Increased revenue	Service-oriented architecture supports Ethernet services with filtering, shaping and QoS on a per-service basis not per port. Distributed intelligence and control (versus traditional infrastructure focused on broadband remote access service [BRAS])	Enables a full range of revenue-generating business and triple-play Ethernet services, which translates directly to profitable operation with customer-enforceable SLAs. Superior provisioning tools make it possible to bring new Ethernet services on line quickly.
Reduced capital requirements	Industry-leading density (by two to three times per rack) compared to competing Layer 2/3 Ethernet switches, with 10 Gb/s architecture available today — all at a highly competitive cost	Improved density increases product lifespan, forestalling the need to upgrade or expand. The combination of hot-pluggable media dependent adapters (MDAs) and small form-factor pluggable (SFP) optics enables service providers to postpone capital expenditure until a customer order for a service is received. Reduced footprint saves expensive floor space.
Lower operating expenses	Industry leading Ethernet operations, administration and maintenance (OA&M) features (e.g., service ping, mirroring and trace route) for rapid service diagnostics and troubleshooting	Reduced operating expenses and improved customer relations
Investment protection	Programmable fast path enables quick and painless adaptation and upgrades to new and evolving standards	Product scalability and programmable architecture ensure forklift-free upgrades, enable remote management, and reduce truck rolls (no technician deployment)
Ability to offer service guarantees	H-QoS enables a service-aware architecture that provides per-service, per-subscriber, per-application guarantees	Service providers can offer the kind of detailed SLAs their customers need for business-critical services
Improved scalability	MPLS-enabled Ethernet removes the 4,096 VLAN limitation of Layer 2/Layer 3 Ethernet switches; MPLS also ensures customer isolation	Satisfies the scalability requirements for offering profitable Ethernet services: scales to tens of thousands services.
Carrier-class reliability	Sub 50 ms failover enabling carriers to offer reliable Ethernet services. Non-stop routing and non-stop service features ensure high availability.	Use of MPLS with Ethernet dramatically improves network stability, availability and performance. High availability essential for satisfying business and consumer markets
Time to market	Simplified service-level provisioning on a per-customer basis	Allows immediate definition of new services per customer

# Services You Can Bank On

As we've seen, the Alcatel-Lucent 7450 ESS provides the kind of technological advances required to operate in a service provider environment. Table 2 describes how the Alcatel-Lucent 7450 ESS enables Ethernet services that address the service provider's inter-region and nationwide requirements.

The Alcatel-Lucent 7450 ESS can also be a key component in a network design that calls for service interworking between frame relay/ATM and Ethernet. The Alcatel-Lucent 7450 ESS can deliver and receive Ethernet traffic from the Alcatel-Lucent 7670 Routing Switch Platform (RSP), which handles the service interworking. With service interworking, providers can deploy the most appropriate access technology at each site in the network. This enables them to maintain current service offerings where appropriate, while providing new Ethernet-based services over the same VPN. The ability to provide a unified frame relay/ATM to Ethernet VPN is critical for service providers who want to offer high-speed Ethernet services, and protect their existing network investment and customer services.

# A Compelling Business Case

The numbers are in and the business case is clear: deploying Ethernet business services using the Alcatel-Lucent 7450 ESS is a wise investment. Alcatel-Lucent's analysis, conducted using fairly conservative estimates for growth, indicate that even considering the initial setup costs, service providers can expect to achieve a positive cash flow within the first two years of implementing Ethernet business services using the Alcatel-Lucent 7450 ESS.

Whether the need is for VPLS or VLL services alone, or these services bundled with Internet access, the business case is solid. Major factors contributing to this positive projection are the operational efficiency improvements and service assurance enabled by Alcatel-Lucent's service-aware OA&M toolkit, template-based provisioning and the superior service management support provided

**Table 2. MPLS-Enabled Ethernet Services**

Name	Description	Advantages Offered
<b>BUSINESS SERVICES</b>		
Ethernet virtual leased line (VLL)	Point-to-point Layer 2 service interconnecting two sites. Also known as Ethernet private line (EPL) or Ethernet line (E-line).	Provides similar functionality to a frame relay or ATM leased line service, but with potential cost savings and ease of use. In demand by enterprises who want to focus on Ethernet offerings.
Ethernet virtual private line service (VPLS)	Multipoint-to-multipoint Layer 2 Ethernet services that interconnect many sites as if they were part of a single LAN. Also known as transparent LAN service (TLS) and Ethernet LAN (E-LAN)	A premier service providing high bandwidth capacity (greater than T1/E1), multiple QoS levels, scalability and the ability to offer rigorous SLAs. VPLS expands the next-generation VPN service market.
<b>SERVICE-AWARE ETHERNET AGGREGATION SERVICES</b>		
Consumer Triple Play residential services	Scalable aggregation of subscribers using Ethernet/VPLS. Initial aggregation may be done via any access node, such as an Ethernet DSLAM or an Ethernet passive optical network node, with handoff to the 7450 ESS.	Provides an alternative to ATM or optical aggregation of traffic from access nodes. Facilitates bundling of services, which in turn can aid in customer retention.
Internet access and IP-VPN backhaul	Services delivered using a combination of the Alcatel-Lucent 7450 ESS (for aggregation and backhaul) and the Alcatel-Lucent 7750 Service Router (SR) (for IP services)	Enables providers to offer low-cost, high-speed Internet access. Also creates the possibility of selling additional services such as VLL, VPLS and IP-VPN.

by the Alcatel-Lucent 5620 Service Aware Manager. These tools allow the service provider to isolate faults and provision services quickly, with an end-to-end perspective, rather than time-consuming connection-by-connection, element-by-element fault tracing and provisioning, which are prone to error.

Ethernet also has the potential to provide huge savings in OPEX, compared to legacy services. Ethernet services can be upgraded remotely from the network operations center, without a truck roll. Services from 1 Mb/s to 100 Mb/s or from 100 Mb/s to 1 Gb/s can be offered in fine increments without changing the physical interface. This flexibility enables service providers to tailor their offering to their customer's exact requirements. For more information on Alcatel-Lucent's analysis of the business case for VPLS, see the publication Delivering Profitable Virtual Private LAN Services, available at [www.alcatel.com/vpls](http://www.alcatel.com/vpls).

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Ethernet OPEX savings related to bandwidth upgrades were 69% to 83% for E-LAN services, such as VPLS, and 66% to 82% for E-line services, such as VLL, compared to legacy services.

METRO ETHERNET FORUM, SERVICE PROVIDER BUSINESS CASE STUDY:  
OPERATING EXPENSES, 2004

## 7450 ESS in the Alcatel-Lucent Solution

Alcatel-Lucent offers a comprehensive portfolio of carrier-class products that enable any service over any access with any backbone infrastructure. The Alcatel-Lucent 7450 ESS is a key product in this portfolio, enabling the delivery of highly profitable, scalable and reliable Ethernet business and consumer triple play services.



**7450 ESS**  
**Enables "ALWAYS ON" Services for ...**

**Business Communications**

**Consumer Entertainment**

"We selected Alcatel because it has the expertise and broad portfolio necessary to evolve our services as the market changes, and to help streamline our business to stay price competitive."

MATS SANDVIK, CEO, VENTELO SWEDEN

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